reaches a value that will cause an excessive or dangerous temperature in the conductor or conductor insulation. A grounded conductor is protected from overcurrent if a protective device of a suitable rating or setting is in each ungrounded conductor of the same circuit.

(b) *Overcurrent protection of conductors.* Each conductor must be protected in accordance with its current carrying capacity, except a conductor for the following circuits which must meet the following listed subparts of this chapter:

(1) Propulsion circuits, Subpart 111.35.

(2) Steering circuits, subchapter F of this chapter.

(3) Motor circuits, Subpart 111.70.

(4) Flexible cord and fixture wire for lighting circuits, Subpart 111.75.

(5) Switchboard circuits, Subpart 111.30.

(c) *Fuses and circuitbreakers.* If the allowable current-carrying capacity of the conductor does not correspond to a standard rating for fuses or circuitbreakers that meets Section 240.6 of NFPA NEC 2002 or IEC 60092–202 (both incorporated by reference; see 46 CFR 110.10–1), then the next larger such rating is acceptable, except that:

(1) This rating must not be larger than 150 percent of the current-carrying capacity of the conductor; and

(2) The effect of temperature on the operation of fuses and thermally controlled circuitbreakers must be taken into consideration.

(d) *Parallel overcurrent protective devices.* An overcurrent protective device must not be connected in parallel with another overcurrent protective device.

(e) *Thermal devices.* No thermal cutout, thermal relay, or other device not designed to open a short circuit may be used for protection of a conductor against overcurrent due to a short circuit or ground, except in a motor circuit as described in Article 430 of NFPA NEC 2002 or in IEC 60092–202.

(f) *Ungrounded conductors.* A fuse or overcurrent trip unit of a circuit breaker must be in each ungrounded conductor. A branch switch or circuit breaker must open all conductors of the circuit, except grounded conductors.

(g) *Grounded conductor.* An overcurrent device must not be in a permanently grounded conductor, except:

(1) An overcurrent device that simultaneously opens all conductors of the circuit, unless prohibited by § 111.05–17 for the bus-tie feeder connecting the emergency and main switchboards; and

(2) For motor-running protection described in Article 430 of NFPA NEC 2002 or in IEC 60092–202.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28279, June 4, 1996; CGD 97–057, 62 FR 51047, Sept. 30, 1997; USCG–2003–16630, 73 FR 65197, Oct. 31, 2008; USCG–2013–0671, 78 FR 60153, Sept. 30, 2013]

§ 111.50–5 Location of overcurrent protective devices.

(a) *Location in circuit.* Overcurrent devices must be at the point where the conductor to be protected receives its supply, except as follows:

(1) The generator overcurrent protective device must be on the ship's service generator switchboard. (See § 111.12–11(g) for additional requirements.)

(2) The overcurrent protection for the shore connection conductors must meet § 111.30–25.

(3) If the overcurrent device that protects the larger conductors also protects the smaller conductors, an overcurrent device is not required at the supply to the smaller conductors.

(4) If the overcurrent device protecting the primary side of a single phase transformer (two wire with single-voltage secondary) also protects the conductors connected to the secondary side, as determined by multiplying the current-carrying capacity of the secondary conductor by the secondary to primary transformer voltage ratio, and this protection meets § 111.20–15 of this chapter, an overcurrent device is not required at the supply to the secondary side conductors.

(b) *Location on vessel.* Each overcurrent device:

(1) Must be:

(i) Readily accessible; and

(ii) In a distribution panelboard, switchboard, motor controller, or similar enclosure; and

(2) Must not be:

(i) Exposed to mechanical damage; and

(ii) Near an easily ignitable material or where explosive gas or vapor may accumulate.

§ 111.50–7 Enclosures.

(a) Each enclosure of an overcurrent protective device must meet Sections 240–30 and 240–33 of NFPA NEC 2002 (incorporated by reference; see 46 CFR 110.10–1).

(b) No enclosure may be exposed to the weather unless accepted by the Commandant.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by USCG–2003–16630, 73 FR 65197, Oct. 31, 2008]

§ 111.50–9 Disconnecting and guarding.

Disconnecting and guarding of overcurrent protective devices must meet Part IV of Article 240 of NFPA NEC 2002 (incorporated by reference; see 46 CFR 110.10–1).

[USCG–2003–16630, 73 FR 65197, Oct. 31, 2008]

Subpart 111.51—Coordination of Overcurrent Protective Devices

§ 111.51–1 Purpose.

The purpose of this subpart is to provide continuity of service for equipment vital to the propulsion, control or safety of the vessel under short-circuit conditions through coordination and selective operation of overcurrent protective devices.

§ 111.51–3 Protection of vital equipment.

(a) The coordination of overcurrent protective devices must be demonstrated for all potential plant configurations.

(b)Overcurrent protective devices must be installed so that:

(1) A short-circuit on a circuit that is not vital to the propulsion, control, or safety of the vessel does not trip equipment that is vital; and

(2) A short-circuit on a circuit that is vital to the propulsion, control, or safety of the vessel is cleared only by the protective device that is closest to the point of the short-circuit.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 62 FR 23908, May 1, 1997]

Subpart 111.52—Calculation of Short-Circuit Currents

§ 111.52–1 General.

The available short-circuit current must be computed—

(a) From the aggregate contribution of all generators that can simultaneously operate in parallel;

(b) From the largest probable motor load; and

(c) With a three phase fault on the load terminals of the protective device.

[CGD 74–125A, 47 FR 15236, Apr. 8, 1982, as amended by CGD 94–108, 61 FR 28279, June 4, 1996]

§ 111.52–3 Systems below 1500 kilowatts.

The following short-circuit assumptions must be made for a system with an aggregate generating capacity below 1500 kilowatts, unless detailed computations in accordance with § 111.52–5 are submitted:

(a) The maximum short-circuit current of a direct current system must be assumed to be 10 times the aggregate normal rated generator currents plus six times the aggregate normal rated currents of all motors that may be in operation.

(b) The maximum asymmetrical short-circuit current for an alternating current system must be assumed to be 10 times the aggregate normal rated generator currents plus four times the aggregate normal rated currents of all motors that may be in operation.

(c) The average asymmetrical short-circuit current for an alternating-current system must be assumed to be 8½ times the aggregate normal rated generator currents plus 3½ times the aggregate normal rated currents of all motors that may be in operation.

§ 111.52–5 Systems 1500 kilowatts or above.

Short-circuit calculations must be submitted for systems with an aggregate generating capacity of 1500 kilowatts or more by utilizing one of the following methods:

(a) Exact calculations using actual impedance and reactance values of system components.